

I claim:

1. An optical arrangement comprising:

a first lens element having at least one first lens, said first lens element having a positive power, and wherein the radius of curvature of the surface of said first lens element proximate to an object plane is less than or approximately equal to the radius of curvature of the surface of said first lens element distal to said object plane;

a second lens element having at least one second lens, said second lens element having a negative power;

a third lens element having at least one lens, said third lens element having positive power;

a fourth lens element having at least one lens, said fourth lens element having a negative power;

a fifth lens element having at least one lens, said fifth lens element having a positive power;

a sixth lens element having at least one lens, said sixth lens element having a positive power;

a seventh lens element having at least one lens, said seventh lens element having a positive power, and wherein the radius of curvature of the surface of said seventh lens element proximate to said object plane is less than or approximately equal to the radius of curvature of the surface of said seventh lens element distal to said object plane; and,

an eighth lens element having at least one lens, said eighth lens element having a positive power,

wherein the distance from said first lens element to said second lens element is sufficient to reduce a ray height of a light ray entering said second lens element from the ray height of said light ray entering said first lens element and wherein the distance from said fifth lens element to said sixth lens element is sufficient to increase said ray height of said light ray entering said sixth lens element from the ray height of said light ray entering said first lens element.

2. The optical arrangement according to Claim 1 wherein said reduction in ray height is less than or equal to about 40%.

3. The optical arrangement according to Claim 1 wherein said increase in ray height is less than or equal to about 200%.
- 5 4. The optical arrangement according to Claim 1, wherein said first lens element has a refractive index of at least about 1.55.
5. The optical arrangement according to Claim 1 wherein the V-number of said second lens element differs from the V-number of said third lens element by at least about 30.
- 10 6. The optical arrangement according to Claim 1, wherein said second lens element is fixedly attached to said third lens element.
7. The optical arrangement according to claim 1, wherein said fourth lens element has a refractive index of at least about 1.55.
- 15 8. The optical arrangement according to Claim 1 wherein the V-number of said fourth lens element differs from the V-number of said fifth lens element by at least about 30.
- 20 9. The optical arrangement according to Claim 1, wherein said fourth lens element is fixedly attached to said fifth lens element.
10. The optical arrangement according to Claim 1 wherein said eighth lens element has a hyperhemispherical shape.
- 25 11. The optical arrangement according to Claim 1 further comprising a cover slip.
12. An optical arrangement comprising;
- 30 a first lens having a positive power and wherein the radius of curvature of the surface of said first lens proximate to an object plane is less than or approximately equal to the radius of curvature of the surface of said first lens distal to said object plane;

a second lens having a negative power;  
a third lens having a positive power;  
a fourth lens having a negative power;  
a fifth lens having a positive power;  
5 a sixth lens having a positive power;  
a seventh lens having a positive power, and wherein the radius of curvature of the surface of said seventh lens proximate to said object plane is less than or approximately equal to the radius of curvature of the surface of said seventh lens distal to said object plane; and,  
10 an eighth lens element having at least one lens, said eighth lens element having a positive power,  
wherein the distance from said first lens to said second lens is sufficient to reduce a ray height of a light ray entering said second lens from the ray height of said light ray entering said first lens and wherein the distance from said fifth lens to said sixth lens is  
15 sufficient to increase said ray height of said light ray entering said sixth lens from the ray height of said light ray entering said first lens.

13. The optical arrangement according to Claim 12 wherein said reduction in ray height is about 40%.

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14. The optical arrangement according to Claim 12 wherein said increase in ray height is less than or equal to about 200%.

15. The optical arrangement according to Claim 12, wherein said first lens has a refractive index of at least about 1.55.

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16. The optical arrangement according to Claim 12 wherein the V-number of said second lens differs from the V-number of said third lens by at least about 30.

17. The optical arrangement according to Claim 12, wherein said second lens is fixedly attached to said third lens.

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18. The optical arrangement according to claim 12, wherein said fourth lens has a refractive index of at least about 1.55.

5 19. The optical arrangement according to Claim 12, wherein the V-number of said fourth lens differs from the V-number of said fifth lens by at least about 30.

20. The optical arrangement according to Claim 12, wherein said fourth lens is fixedly attached to said fifth lens.

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21. The optical arrangement according to Claim 12 wherein said eighth lens is a hyperhemispherical lens.

22. The optical arrangement according to Claim 12 further comprising a cover slip.

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23. An optical arrangement comprising:

a first lens element having at least one first lens, said first lens element having a positive power, and wherein the radius of curvature of the surface of said first lens element proximate to an object plane is less than or approximately equal to the radius of curvature of the surface of said first lens element distal to said object plane;

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a second lens element having at least one second lens, said second lens element having a negative power, wherein the distance from said first lens element to said second lens element is sufficient to reduce a ray height of a light ray entering said second lens element from the ray height of said light ray entering said first lens element;

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a plurality of lenses, said plurality having,

at least one negative lens; and,

at least two lenses each having a positive power and wherein the radius of curvature of the surface of one of said at least two positive power lenses proximate to an object plane is less than or approximately equal to the radius of curvature of the surface of said one of said at least two positive power lenses distal to said object plane, wherein the distance from a second of said

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at least two positive lenses to said one of said at least two positive power lenses is sufficient to increase said ray height of said light ray entering said one of said at least two positive power lenses from the ray height of said light ray entering said first lens element lens; and,  
5 a final lens having a positive power.

24. The optical arrangement according to Claim 23 wherein said reduction in ray height is about 40%.

10 25. The optical arrangement according to Claim 23 wherein said increase in ray height is less than or equal to about 200%.

26. The optical arrangement according to Claim 23 wherein said first lens element has a refractive index of at least about 1.55.  
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27. The optical arrangement according to Claim 23 wherein said final lens is a hyperhemispherical lens.

28. The optical arrangement according to Claim 23 further comprising a cover slip.  
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